SECTION 16139

METAL CABLE TRAY

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LANL MASTER CONSTRUCTION SPECIFICATION

When editing to suit Project, author shall add job-specific requirements and delete only those portions that do not apply to the Project (e.g., a component that does not apply). To seek a variance from applicable requirements, contact the Engineering Standards Manual (ESM) Electrical POC. Refer to http://www.lanl.gov/f6stds/pubf6stds/engrman/HTML/poc_techcom1.htm for the Engineering Standards Manual Personnel Link Index.

When assembling a specification package, include applicable specifications from all Divisions, especially Division 1, General Requirements.

Delete information within “stars” during editing.

Specification developed for ML-3 / ML-4 projects. For ML-1 / ML-2, additional requirements and QA reviews are required.

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PART 1 GENERAL

1.1 SECTION INCLUDES

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Edit list match project requirements.

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A. Metal cable tray and fittings.

1.2 LANL PERFORMED WORK

A. None

1.3 SUBMITTALS

A. Submit the following in accordance with Section 01330, Submittal Procedures:

1. Catalog Data:

a. Submit manufacturer's data on cable tray including, but not limited to, types, materials, finishes, rung spacings, inside depths and fitting radii.

b. Submit manufacturer's data on smoke seal and fire stop products.

2. Test Reports: Provide results of tests performed or witnessed by an independent testing laboratory of the "worst case" loading conditions outlined in this specification and performed in accordance with the latest revision of NEMA VE-1; including test reports verifying rung load capacity in accordance with NEMA VE-1 Section 5.4.

3. Shop Drawings: Detail fabrication and installation of cable tray, including plans, elevations, and sections of components and attachments to other construction elements. Designate components and accessories, including clamps, brackets, hanger rods, splice-plate connectors, expansion-joint assemblies, straight lengths, and fittings. Include floor plans and sections drawn to scale. Include scaled cable tray layout and relationships between components and adjacent structural and mechanical elements.

4. Design Calculations: Verify loading capacities for supports.

5. Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.4 REGULATORY REQUIREMENTS

A. Conform to requirements of the *National Electrical Code* (NEC).

B. Conform to applicable requirements of NEMA VE1 *Metal Cable tray Systems* and NEMA VE2 *Metal Cable tray Installation Guidelines*.

C. Furnish products listed and labeled by a Nationally Recognized Testing Laboratory (NRTL) as suitable for purposes specified and shown.

1.5 COORDINATION

A. Coordinate cable tray, hangers, and accessories with adjacent architectural, structural, mechanical, and electrical elements.

1.6 RECEIVING, STORING AND PROTECTING

A. Receive, store, and protect, and handle products according to NECA 1 *Standard Practices for Good Workmanship in Electrical Construction* and NECA/NEMA 105 *Recommended Practice for Installing Metal Cable Tray Systems*.

PART 2 PRODUCTS

2.1 PRODUCT OPTIONS AND SUBSTITUTIONS

A. Refer to Section 01630, Product Options and Substitutions.

2.2 METAL CABLE TRAY

A. Provide metal cable tray and accessories conforming to NEMA VE-1, the NEC, and this Section.

B. Provide cable trays, of types, classes and sizes indicated on the Drawings or specified, complete with splice plates, bolts, nuts and washers for connecting units.

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Edit the following article to match project conditions.
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C. Provide cable tray that is capable of carrying not less than the following uniformly distributed and concentrated loads at the rated support span with a safety factor of 1.5 when supported as a simple span and tested per NEMA VE1 Section 5.2. Load and safety factors specified are applicable to both side rails and rung capacities.

1. 6 and 12 inch widths: 50 lb. per linear foot plus a 200 lb. load at mid-span.

2. 18 and 24 inch widths: 75 lb. per linear foot plus a 200 lb. load at mid-span.

3. 30 and 36 inch widths: 100 lb. per linear foot plus a 200 lb. load at mid-span.

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Edit the following article to match project conditions. Delete materials not used on the project. If more than one material is needed, the Drawings should clearly indicate material requirements. Aluminum alloy cable tray can be used for most indoor and outdoor applications. Use pre-galvanized steel cable tray for indoor, non-corrosive environments where greater strength or longer spans are required. Use hot-dip galvanized cable tray for non-chemical industrial outdoor and indoor applications. Use stainless steel cable tray for severe chemical environments.
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D. Materials and finish:

1. Aluminum: Straight section and fitting side rails and rungs extruded from aluminum alloy.

2. Pre-galvanized Steel: Straight sections, fitting side rails, rungs, and covers made from steel meeting the minimum structural properties and mill galvanized in accordance with ASTM A653 coating designation G90.

3. Hot-dip Galvanized Steel: Straight section and fitting side rails and rungs made from steel meeting the minimum structural properties and hot-dip galvanized after fabrication in accordance with ASTM A123. All covers and splice plates must also be hot-dip galvanized after fabrication; mill galvanized covers are not acceptable for hot-dipped galvanized cable tray. Inspect hot-dip galvanized after fabrication steel cable trays after coating and remove excess zinc.

4. Stainless Steel: Straight section and fitting side rails and rungs made of AISI Type 304 or Type 316 stainless steel. Transverse members (rungs) or corrugated bottoms welded to the side rails with Type 316 stainless steel welding wire.

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Edit the following article to match project conditions. Delete cable tray types not used on the project. If more than one cable tray type is needed, the Drawings should clearly indicate requirements.
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E. Type of tray system:

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Edit the following article to match project conditions. Delete rung spacings not used on the project. If more than one rung spacing is needed, the Drawings should clearly indicate material requirements. Use 6 inch rung spacings for small telecommunications and control cables. Use 9 inch or greater rung spacing for power cables.
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1. Provide ladder type trays consisting of two longitudinal members (side rails) with transverse members (rungs) welded to the side rails. Rung spacing shall be [6] [9] [12] [18] inches on center. Spacing in radiused fittings shall not exceed 9 inches measured at the center of the tray's width.

2. Provide ventilated trough type trays consisting of two longitudinal members (side rails) with a corrugated bottom welded to the side rails. To provide ventilation in the tray, the valleys of the corrugated bottom shall have rectangular holes punched along the width of the bottom.

3. Provide solid bottom trough type trays consisting of two longitudinal members (side rails) with a corrugated bottom welded to the side rails.

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Edit the following article to match project conditions. Delete cable tray sizes not used on the project. If more than one cable size type is needed, the Drawings should clearly indicate requirements.
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F. Tray dimensions:

1. Provide cable tray with [3] [4] [5] [6] inch minimum usable load depth, or as noted on the Drawings.

2. Provide straight tray sections with side rails fabricated as I-beams or C-sections. Supply straight sections in standard [10] [12] [20] [24] foot lengths, except where shorter lengths are needed to facilitate tray assembly lengths shown on Drawings.

3. Provide cable tray widths of [6] [9] [12] [18] [24] [30] [36] inches or as shown on Drawings.

4. Provide fittings with a minimum inside radius of [12] [24] [36] inches.

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Edit the following article to match project conditions. Delete materials not used on the project.
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G. Provide bolted type splice plates made as indicated below for each tray type. The resistance of fixed splice connections between adjacent sections of tray shall not exceed 0.00033 ohms. Splice plate construction shall be such that a splice may be located anywhere within the support span without diminishing rated loading capacity of the cable tray.

1. Aluminum Tray: Provide splice plates made of aluminum alloy with four square neck carriage bolts and serrated flange locknuts. Hardware shall be zinc plated in accordance with ASTM B633, SC1. If aluminum cable tray is to be used outdoors then hardware shall be Type 316 stainless.

2. Steel (including Pre-galvanized and Hot-dip galvanized): Provide splice plates manufactured of high strength steel, meeting the minimum mechanical properties of ASTM A1011 HSLAS, Grade 50, Class 1. Attach each splice plate with four ribbed neck carriage bolts with serrated flange locknuts. Hardware shall be zinc plated in accordance with ASTM B633 SC1 for pre-galvanized cable trays, or Chromium Zinc in accordance with ASTM F-1136-88 for hot-dip galvanized cable trays.

3. Furnish splice plates with straight sections and fittings.

H. Place cable tray supports so that the support spans do not exceed span ratings of cable tray sections.

1. Construct trapeze supports from 12 gauge steel formed shape channel members 1-5/8 inch by 1-5/8 inch with necessary hardware.

2. Support cable trays installed adjacent to walls on wall mounted brackets.

3. Provide center hung supports manufactured of 12 gauge, 1-5/8 inch by 1-5/8 inch steel strut with a pipe welded at the middle of the support to provide eccentric loading stability. Support shall withstand 700 pounds in a 60 percent vs. 40 percent eccentric loading condition with a safety factor of 3.

4. Provide 1/2 inch (minimum) diameter threaded rods to support trapeze hangers and center-hung supports.

I. Install a warning label with the following message on each cable tray section and fitting:

WARNING:
DO NOT USE CABLE TRAY AS A WALKWAY LADDER OR SUPPORT. USE ONLY AS MECHANICAL SUPPORT FOR CABLES AND TUBING.

J. Provide barrier strips as indicated on the Drawings. Fasten barrier strips into the tray with self-drilling screws.

K. Furnish accessories as shown on the Drawings and as required to protect, support, and install a cable tray system and associated cables. Accessories include section splice plates, expansion plates, blind-end plates, ladder dropouts, and barriers.

2.3 EQUIPMENT GROUNDING CABLE

A. Provide not smaller than 6 AWG bare stranded, soft temper copper cable that conforms to ASTM B8, Standard Specification for Concentric-Lay Stranded Copper Conductors.

2.4 CABLE TRAY GROUND CLAMPS

A. Provide NRTL listed cable tray ground clamps suitable for use with aluminum cable tray and copper equipment grounding conductor.

B. Manufacturer: O-Z/Gedney “Type CTGC”, Crouse-Hinds “TGC40”

2.5 CABLE TRAY/CONDUIT BONDING CLAMPS

A. Provide NRTL listed clamps suitable for mechanically connecting and electrically bonding conduit to steel or aluminum cable tray.

B. Manufacturer: Thomas & Betts “6200 Series”, Crouse-Hinds “LCC Series”

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Edit the following article to match project conditions. Coordinate with LANL Construction Specification Section 07840 *Fireproofing*. Delete materials not used on the project.

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2.6 FIRE STOP

A. Provide fire stop products, materials, and systems listed in the UL *Fire Resistance Directory* and described in this Section.

1. Provide products or combinations of materials to restore the integrity of all fire-rated walls or floors that are penetrated by cables and/or cable tray so as to restore the fire integrity of the wall or floor and prevent the spread of heat, fire, gasses, and smoke.

2. Provide products or combinations of materials to seal boundaries of radiological areas that are penetrated by cables and/or cable tray so as to prevent the spread radiological contamination.

3. Provide products or combinations of materials to seal penetrations where cables or cable trays pass between areas where air pressure differential must be maintained.

B. Provide fire stop products, materials, and systems that meet the following performance and quality assurance requirements:

1. Conform to both flame and temperature ratings as required by nationally recognized testing laboratories per ASTM E814 or UL 1479 *Fire Tests of Through-Penetration Fire Stops* a configuration that is representative of installation condition on this Project.

2. Be capable of closing or filling through-openings created by the burning of combustible cable jacketing or movement of cable tray due to thermal expansion.

3. Be compatible with and appropriate for:

a. The cable tray dimensions and materials,

b. The cable sizes and jacket materials, and

c. The materials and construction of the penetrated wall or floor.

d. The environment at the installation location.

4. Allow future cable changes.

5. Not affect the electrical properties of power or communications cables

C. Cable Tray / Multi-cable Sealing System

1. Provide cable tray / multi-cable sealing system consisting of a two-piece steel enclosure, fixation plate, intumescent rubber sponge void fillers, fire-resistant gaskets, and fireproof sealant.

2. Provide metal housing suitable for the cable tray size and installation location environment: enameled steel for non-corrosive indoor environments, galvanized steel for wet or outdoor environments, stainless steel for corrosive environments.

3. Provide manufacturer's weather shield fitting for each sealing system exposed to weather.

4. Manufacturer: CSD Sealing Systems "FIRSTO".

D. Multi-Cable Transit Assembly

1. Provide multi-cable transit system consisting of the required number and size mounting frames, elastomer sealing modules to fit around each cable and close openings, plus accessories required for a complete system.

2. Manufacturer: Nelson "MCT" or "MPS", Crouse-Hinds "TW Series"

E. Re-enterable Fire Barrier Mortar

1. Provide fire barrier mortar having a variable mix ratio, permitting self-leveling as well as no forming application consistencies.

2. Mortar shall bond to concrete, metals, wood, plastic and cable jacketing and shall be re-enterable without use of power tools. Mortar shall bond to itself, facilitating repair procedures.

3. Mortar shall be Warnock Hersey Certified for 2-hour separations.

4. Manufacturer: 3M "Fire Barrier Mortar"

F. Intumescent Fire Block.

1. Provide ready-to-use, intumescent flexible blocks based on two-component polyurethane foam that is free from dust, fibers, halogen, and solvents.

2. Dimensions 2 in. x 5 in. x 8 in.

3. Expansion rate up to 1:5

4. Manufacturer: Hilti “FS 657”

G. Intumescent Fire Stop Sealant:

1. Provide ready-to-use water-based intumescent fire stop sealant that is resistant to smoke, gas, and water and is free from halogen, solvents or asbestos.

2. Expansion rate up to 3-5 times original volume.

3. Hilti “FS-ONE”

H. Provide red and white self-adhesive labels, or plastic or metal plates stating as a minimum that the installation is a “through-penetration fire stop system,” and installation data (UL-Listed or FM-Approved configuration number, date installed, installer and organization). Also state “Modify/remove only with LANL Fire Group approval” if space permits. Examples of acceptable products:

1. Hilti sticker P/N 00339611

2. Hilti plate P/N 00306219

I. Refer to Section 07840 *Fireproofing* for additional product requirements.

PART 3 EXECUTION

3.1 EXISTING WORK

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Delete this article when existing construction is not affected.
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A. Remove abandoned cable tray, including associated hangers and accessories.

B. Maintain access to existing cable trays and other installations remaining active and requiring access. Modify installation or provide access panels.

C. Clean and repair existing cable trays and accessories to remain or to be reinstalled.

3.2 EXAMINATION

A. Examine spaces to receive cable tray for compliance with installation tolerances and other conditions affecting performance of the raceway system. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.3 CABLE TRAY INSTALLATION

A. Install cable tray where indicated on the Drawings and according to manufacturer's instructions. Have the manufacturer’s instructions available at the construction site.

B. Install cable tray in accordance with NECA/NEMA 105—*Recommended Practice for Installing Metal Cable Tray Systems*.

C. Install cable tray in accordance with the National Electrical Code.

D. Coordinate cable tray, hangers, and accessories with adjacent architectural, structural, mechanical, and electrical elements.

E. Provide not less than 12 inches of clear space above and to one side of cable trays to permit access for installing and maintaining cables.

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In the following article select the current LANL specification section number for supports.
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F. Support trays in accordance with NECA/NEMA 105 and Section [16190] [16070] *Supporting Devices*.

1. Use minimum 1/2-inch threaded rods to support cable tray.

2. Locate cable tray fitting supports so they meet the strength requirements of straight sections. Install fitting supports per NECA/NEMA 105 and in accordance with manufacturer's instructions.

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Coordinate the following article with the Drawings. Drawings must indicate requirements for lateral and longitudinal bracing as described in Section D5090 of the LANL Engineering Standards Manual.
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3. Install transverse and lateral seismic bracing for individual cable trays as indicated on the Drawings

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In the following article select the current LANL specification section number for grounding.
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G. Ground and bond cable tray under provisions of Section [16450] [16060] *Grounding*.

1. Provide electrical continuity between tray components.

2. Use anti-oxidant compound to prepare aluminum contact surfaces before assembly.

3. Install not smaller than 6 AWG bare copper equipment grounding conductor along the entire length of tray; bond to each component using cable tray ground clamps. Consistently place grounding conductor on the outside of one cable tray side rail and complete all bonds before placing any cables in the cable tray.

4. Make mechanical and electrical bond connection between conduits and cable tray using cable tray/conduit bonding clamps.

3.4 FIRE STOP INSTALLATION

A. Install fire stop products or combinations of fire stop materials to restore the integrity of all fire-rated walls or floors that are penetrated by cables and/or cable tray so as to restore the fire integrity of the wall or floor and prevent the spread of heat, fire, gasses, and smoke.

B. Install fire stop products or combinations of fire stop materials to seal boundaries of radiological areas that are penetrated by cables and/or cable tray so as to prevent the spread radiological contamination.

C. Install fire stop products or combinations of fire stop materials to seal penetrations where cables or cable trays pass between areas where air pressure differential must be maintained.

D. Install fire stop products in accordance with manufacturer's instructions and the UL Fire Resistance Directory.

E. Refer to Section 07840 *Fireproofing* for additional installation requirements.

3.5 LABELING

A. Install red warning labels with 1/2-inch white letters and the following message at visible locations 50 foot on centers on all cable trays in environmental or return air plenums:

USE ONLY PLENUM RATED CABLES IN THIS CABLE TRAY.

B. Install white labels with 1/2-inch black letters and the following information at visible locations 50 foot on centers on all cable trays:

1. Maximum cable tray loading depth

2. Allowable cable load in pounds per foot based on the as-installed support span spacing and structural support capability.

C. Label fire barrier penetration seals on both sides of the penetrated fire barrier. Use labels per Part 2.

3.6 FIELD QUALITY CONTROL

A. Inspect accessible components for cleanliness, mechanical, and electrical integrity, and for presence of damage or deterioration before energizing.

B. After completing installation, cleaning, and testing, touch up scratches and mars on finish to match original finish.

END OF SECTION

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Do not delete the following reference information.

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FOR LANL USE ONLY

This project specification is based on LANL Master Construction Specification Rev. 0, dated February 25, 2004.